



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B24E/B1 BYPASS RATIO (-): 5.3  
 UNIQUE ID NUMBER: 01P11CM115 PRESSURE RATIO  $\pi_{co}$  (-): 25.6  
 COMBUSTOR: Tech Insertion  
 ENGINE TYPE: TF RATED OUTPUT  $F_{co}$  (kN): 107.6

### REGULATORY DATA

CHARACTERISTIC VALUES:	$LTO_{mass}/F_{co}$ (mg/kN)	$LTO_{num}/F_{co}$ (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
LTO/ $F_{co}$ AND MAX nvPM <sub>mass</sub>	82.8	1.03E+15	1434
AS % OF CAEP/10 LIMIT	-	-	22.5
AS % OF CAEP/11 LIMIT (InP)	3.5	7.0	
AS % OF CAEP/11 LIMIT (NT)	16.3	16.6	

### MEASURED DATA

MODE	POWER SETTING (% $F_{co}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM <sub>mass</sub> ( $\mu\text{g}/\text{m}^3$ )
				EI <sub>mass</sub> (mg/kg)	EI <sub>num</sub> (particles/kg)	
TAKE-OFF	100	0.7	1.086	48.6	4.28E+14	
CLIMB OUT	85	2.2	0.895	33.6	4.24E+14	
APPROACH	30	4.0	0.308	1.3	5.46E+13	
IDLE	7	26.0	0.103	0.8	3.69E+13	
LTO TOTAL (kg, mg, number of particles)			398	6408	7.95E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{co}$ VALUES (mg/kN, particles/kN)				59.6	7.39E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				48.6	4.31E+14	1114

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% $F_{co}$ )	CORRECTED EMISSIONS INDICES	
		EI <sub>mass_SL</sub> (mg/kg)	EI <sub>num_SL</sub> (particles/kg)
TAKE-OFF	100	58.3	1.24E+15
CLIMB OUT	85	41.7	1.39E+15
APPROACH	30	2.0	3.10E+14
IDLE	7	1.2	2.12E+14

### AMBIENT CONDITIONS

	From		To	
	BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT(%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International  
 TEST ORGANIZATION: Safran Aircraft Engines  
 TEST LOCATION: Villaroche, France  
 TEST DATES: 25/07/2019-30/07/2019

### REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B